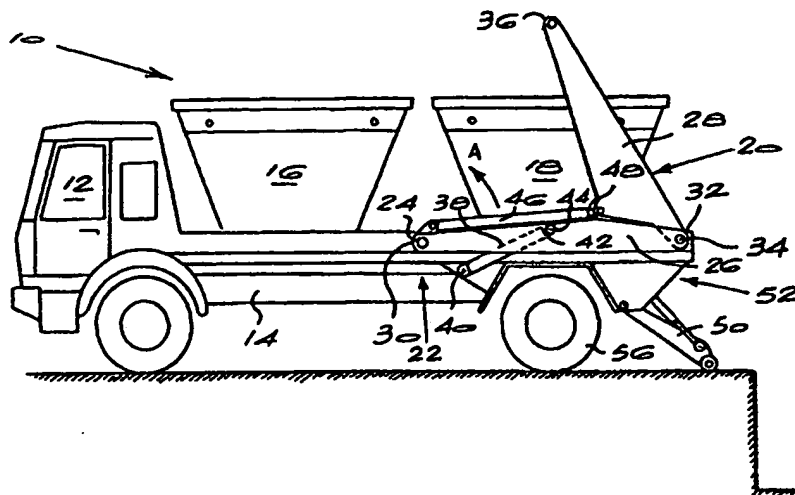




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: <b>PCT/IB99/01665</b></p> <p>(22) International Filing Date: <b>13 October 1999 (13.10.99)</b></p> <p>(30) Priority Data: <b>98/9322 13 October 1998 (13.10.98) ZA</b></p> <p>(71) Applicant (for all designated States except US): <b>SHAWTRANS EQUIPMENT (PROPRIETARY) LIMITED [ZA/ZA]; Cnr Rogers &amp; Weyers Road, 1449 Alrode South (ZA).</b></p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): <b>SHAW, Colin, Wray [ZA/ZA]; 4 Marquis Close, Waterford Estate, 2055 Fourways (ZA).</b></p> <p>(74) Agents: <b>WHITTAKER, Jonathan, Denis et al.; Spoor and Fisher, (Rochester Place 173 Rivonia Road Morningside, Sandton), P.O. Box 41312, 2024 Craighall (ZA).</b></p>	<p>(81) Designated States: <b>AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</b></p> <p><b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>	

(54) Title: REFUSE-HANDLING VEHICLE



## (57) Abstract

The invention relates to a refuse-handling vehicle (10) in the form of a truck. The vehicle (10) includes a wheeled chassis (14) and a pair of lifting arms (20) pivotally connected to opposed sides of the chassis (14) for loading a bucket onto or offloading a bucket from the chassis. Each lifting arm (20) includes a first arm member (26) pivotally connected at one end (30) to a central region (22) of the chassis (14) spaced from the front and rear ends of the chassis, and a second arm member (28) pivotally connected to the other end (32) of the first arm member. A cylinder (38) and ram (42) is provided for pivoting each first arm member (26) relative to the chassis (14), and a cylinder (46) and ram (48) is provided for pivoting each second arm member (28) relative to its corresponding first arm member (26). The chassis (14) of the vehicle (10) is specifically designed to carry two buckets (16 and 18) one in front of the other, and the lifting arms (20) are sized to load or offload each of the buckets independently of one another.

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## **REFUSE-HANDLING VEHICLE**

### **BACKGROUND OF THE INVENTION**

THIS invention relates to a refuse-handling vehicle. More specifically, the invention relates to a refuse-handling vehicle for carrying two refuse-loading buckets simultaneously.

A number of different types of refuse-handling vehicles exist. Some of these vehicles are in the form of trucks or trailers which have integrally formed loading bins. Others are designed to carry refuse-loading buckets which can be loaded onto or offloaded from the vehicle.

Conventional refuse-handling vehicles with detachable loading buckets generally have a pair of lifting arms which project upwardly from a rear end of the vehicle and which are pivotable relative to the vehicle chassis for loading a bucket onto the vehicle chassis or offloading the bucket from the chassis. A disadvantage associated with these types of vehicles is that the lifting arms transfer loads received from a loading bucket directly to the rear end of the chassis, and this can cause the vehicle to tip backwards during the loading or offloading of the bucket. Accordingly, stabiliser legs are usually provided to stabilise the vehicle during loading and offloading. A further drawback associated with these vehicles is that normally they are designed to carry only one bucket at a time which limits the efficiency of the vehicle.

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Refuse-handling vehicles which are designed to carry two buckets one in front of the other are also known, but generally these vehicles cannot load and offload each of the buckets independently of one another. Accordingly, in order to load or offload the front bucket, the rear bucket must first be offloaded and then later loaded back onto the vehicle. This loading or offloading procedure can be time consuming and tends to affect the efficiency of the vehicle.

It is an object of the present invention to provide a refuse-handling vehicle which can carry two buckets one behind the other and which has means for loading, offloading and tipping each of the buckets independently of one another.

#### **SUMMARY OF THE INVENTION**

According to the invention there is provided a refuse-handling vehicle in the form of a truck or a trailer including:

a wheeled chassis having a front end and a rear end;

a pair of lifting arms pivotally connected to opposed sides of the chassis for loading a bucket onto or offloading a bucket from the chassis, each lifting arm including a first arm member pivotally connected at one end to a central region of the chassis spaced from the front and rear ends of the chassis, and a second arm member pivotally connected to the other end of the first arm member;

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primary drive means for pivoting the first arm members relative to the chassis; and

secondary drive means for pivoting the second arm members relative to the first arm members.

In a preferred embodiment of the invention, the chassis is designed to carry two buckets one in front of the other, and the lifting arms are sized to load or offload each of the buckets independently of one another.

Typically, the first arm members are pivotable between a lowered position in which they extend backwards from the central region of the chassis towards the rear end thereof and are substantially parallel with the chassis, and a raised position in which the first arm members extend upwardly from the central region of the chassis transversely to the chassis.

The primary and secondary drive means in a preferred arrangement comprise double-acting hydraulic cylinders and rams.

The hydraulic cylinders of the primary drive means may be connected to the wheeled chassis and the corresponding rams of the primary drive means may be connected to the first arm members so that extension of the rams from the cylinders causes the first arm members to move from the lowered position to the raised position, and retraction of the rams into the cylinders causes the first arm members to move from the raised position to the lowered position.

The cylinders of the secondary drive means may be connected to the first arm

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members and the corresponding rams of the secondary drive means may be connected to the second arm members so that extension of the rams from the cylinders and retraction of the rams into the cylinders causes the second arm members to pivot relative to the first arm members.

Preferably, the first arm members are connected to one another by means of a torsion bar which extends through the chassis and which is rotatable relative to the chassis for allowing the first arm members to pivot between the lowered and the raised positions.

In a particularly preferred arrangement, the second arm members are connected to one another by means of a cross beam.

Each of the second arm members may carry a tipping device in the form of a cable and pulley system which is operated by a further hydraulic cylinder and ram for tipping a bucket relative to the chassis. Typically, for each second arm member, a steel cable is connected at one end to the arm member, and is arranged to extend over a first pulley carried by the ram and a second pulley carried by the cylinder to a free end secured to a shackle or the like for connecting the cable to a bucket. To tip a bucket supported by the lifting arms and connected at one end to the free ends of the cables, the tipping rams are extended from the cylinders so as to cause the ends of the cables connected to the end of the bucket to be drawn towards the second pulleys, thereby to rotate the bucket relative to the lifting arms.

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### **BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:

- Figures 1 to 4** show side views of a refuse-handling vehicle according to the present invention with lifting arms in different positions during the offloading of one of a pair of buckets carried by the vehicle;
- Figures 5 and 6** show side views similar to those illustrated in Figures 1 to 4 with the lifting arms in different positions during the offloading of the other of the pair of buckets carried by the vehicle; and
- Figure 7** shows a side view of a tipping device on one of the lifting arms of the refuse-handling vehicle of the invention.

### **DESCRIPTION OF AN EMBODIMENT**

Figures 1 to 6 of the drawings illustrate a refuse-handling vehicle 10 according to the present invention. In this embodiment of the invention, the vehicle is in the form of a truck having a cab 12 and a wheeled chassis 14. As can be seen, the wheeled chassis is designed to carry two refuse-loading buckets 16 and 18 which can be arranged one in front of the other on the chassis.

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Referring in particular to Figure 1 of the drawings, a pair of lifting arms designated generally with the reference numeral 20 is pivotally connected to opposite sides of a central region 22 of the chassis 14 by means of a torsion bar 24 which extends through the chassis from one lifting arm to the other. It will be appreciated that only one of the pair of arms 20 is visible in the drawings. Each of the lifting arms includes a first arm member 26 and a second arm member 28. The first arm member 26 of each lifting arm extends backwards from one end 30 connected to the torsion bar 24 to another end 32 connected to the second arm member 28 by means of a pivot pin 34. The ends 36 of the second arm members 28 are connected to one another by means of a cross beam (not visible) so that the arm members 28 and the cross beam together form an inverted U-shaped structure for supporting the buckets 16 and 18 when they are loaded onto or offloaded from the chassis 14.

The lifting arms 20 are connected to drive means in the form of a series of double-acting hydraulic cylinders and rams for pivoting the arm members 26 and 28 relative to one another and to the chassis 14. In this regard, a hydraulic cylinder 38 is pivotally connected to each side of the chassis 14 at a pivot pin 40 and a corresponding ram 42 is pivotally connected to each of the first arm members 26 at a pivot pin 44. Another hydraulic cylinder 46 is pivotally connected to each of the first arm members 26 and a corresponding ram 48 is pivotally connected to each of the second arm members 28, as shown.

Accordingly, as the rams 42 are extended from the cylinders 38, the first arm members 26 are pivoted in the direction of the arrow A from a lowered position in which they are substantially parallel with the chassis 14, as illustrated in Figure 1, to a raised position in which they extend upwardly



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from the chassis, as illustrated in Figure 2. Conversely, retraction of the rams 42 draws the first arm members back from the raised position into the lowered position. With suitable extensions and retractions of the rams 48, the second arm members can be pivoted relative to the first arm members between a first position in which the arms 28 are orientated transversely with respect to the arm members 26 (see Figures 1, 2 and 5) and a second position in which the respective arm members 26 and 28 are substantially parallel and are aligned with one another (see Figures 3, 4 and 6).

The wheeled chassis also includes a pair of stabiliser legs 50 (only one of which can be seen in the drawings) at a rear end 52 thereof which can be raised and lowered, hydraulically, between an operative position and an inoperative position.

In practice, the refuse-handling vehicle 10 is used to deliver empty refuse-loading buckets to refuse collection points and to transport refuse loaded into these buckets from the refuse collection points to refuse dump sites. The operation of the vehicle for the purpose of loading and offloading the buckets is described below with reference to Figures 1 to 6 of the accompanying drawings.

Referring first to Figures 1 to 4 of the drawings, the bucket 16 is offloaded from the chassis 14 by means of the lifting arms 20 as follows. Initially, the lifting arms are pivoted from the lowered position illustrated in Figure 1 to the raised position illustrated in Figure 2 by extending the rams 42 from the cylinders 38. In this position, lifting chains 54 are attached by means of shackles or the like to lifting lugs 56 on both sides of the bucket 16.

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Thereafter, the second arm members 28 are pivoted relative to the first arm members from the position illustrated in Figure 2 to the position illustrated in Figure 3 by extending the rams 48 from the cylinders 46. It will be appreciated that the lifting arms 26 and 28 are sized to allow the bucket 16 to be raised over the bucket 18 during this step. Once the bucket 16 reaches the position illustrated in Figure 3, the arm members 26 are lowered again into the position illustrated in Figure 4 by retracting the rams 42 into the cylinders 38. In Figure 4, the bucket 16 is seen in an offloaded position in which it can be disconnected from the lifting arms 20 by removing the chains 54 from the lifting lugs on the bucket.

In order to load the bucket 16 onto the chassis 14, the procedure described above is reversed. Accordingly, after attaching the chains 54 to the bucket 16, the arms 26 are raised into the Figure 3 position, the arms 28 are pivoted into the Figure 2 position and the chains are then detached from the bucket.

The connection of the arm members 26 to the central region of the chassis 14 as illustrated in the drawings is important because it allows the lifting arms 20 to load and offload the bucket 16 independently of the bucket 18.

Referring now to Figures 5 and 6 of the drawings, the bucket 18 is offloaded from the chassis 14 by positioning the lifting arms 20 in the position illustrated in Figure 5 and connecting the chains 54 to the bucket 18 in a similar fashion to that described above with reference to the bucket 16. Thereafter, the arm members 28 are pivoted relative to the arm members 26 by extending the rams 48 from the cylinders 46. As the rams 48 are extended, the arm members 28 move from the position illustrated in Figure 5 to the

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position illustrated in Figure 6. In Figure 6, the bucket 18 is positioned on the ground and can be disconnected from the lifting arms 20 by simply detaching the chains 54 from the bucket. To load the bucket 18, the chains 54 are connected to the bucket and the arm members 28 are pivoted back into the Figure 5 position.

During the loading and offloading operations described above, the stabiliser legs 50 are maintained in a lowered position, as shown, as a safety precaution. However, it will be appreciated that since the loads received by the lifting arms 20 during loading and offloading are transferred to a central region of the chassis 14 in front of the rear wheels 56, the vehicle 10 is relatively stable during loading and offloading when compared with conventional refuse-handling vehicles.

In Figure 7, a tipping device 58 for tipping the buckets 16 and 18 is illustrated. The device 58 comprises two cable and pulley systems (only one of which is shown) attached to the arm members 28. The arm member 28 illustrated in Figure 7 can be seen to carry a pair of pulleys 60 and 62 at either end of a hydraulic cylinder 64 and ram 66. A steel cable 68 is connected at one end 70 to the arm member 28 and is arranged to extend over the pulleys 60 and 62 to a free end 72 in the manner illustrated. The free end 72 carries a shackle or the like which is connectable to a tipping lug 74 welded to the bucket 16.

To tip the bucket 16 while it is supported on the lifting arms 20 by the chains 54, the free ends 72 of the steel cables 68 are connected to the tipping lugs 74, typically before the bucket is raised off the chassis 14, and the rams 66 are extended from a withdrawn position inside the cylinders 64 to an extended

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position, as illustrated in Figure 7. As the rams are extended, the free ends 72 of the cables 68 are drawn towards the pulleys 62, thereby causing the bucket 16 to rotate about the cross beam extending between the upper ends 36 of the arm members 28 from a non-tipping position, illustrated in broken outline in Figure 7, to a tipping position illustrated in solid outline in this Figure. When the rams 66 are withdrawn into the cylinders 64, the cables are fed off the pulleys 62 so as to allow the bucket 16 to rotate back into the non-tipping position.

The various hydraulic cylinders on the vehicle 10 are connected to a hydraulic power pack (not shown) on the chassis 14 which is powered by the power take-off shaft of the vehicle (also not shown).

Although the invention has been described above with reference to a refuse-handling vehicle for handling refuse-loading buckets, it should be appreciated that the vehicle could also be used for various other purposes in which containers are transported from one location to another. For example, the vehicle may be used for earthmoving, for internal transportation in steelworks and forges, or for recovery of scrap metal.

It should also be appreciated that the design of the lifting arms 20 allows for a plurality of empty buckets to be stacked one on top of the other on the chassis 14 so that a plurality of buckets can be delivered to various refuse collection points in one trip.

One advantage of the refuse-handling vehicle of the embodiment of the invention described above is that the lifting arms 20 are arranged to load or

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offload each of the buckets 16 and 18 independently of one another. Another advantage is that the lifting arms are arranged to transfer loads received from the buckets to the chassis 14 at a central region of the chassis, thereby to improve the stability of the vehicle during loading, offloading or tipping.

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### **CLAIMS**

1. A refuse-handling vehicle in the form of a truck or a trailer including:

a wheeled chassis having a front end and a rear end;

a pair of lifting arms pivotally connected to opposed sides of the chassis for loading a bucket onto or offloading a bucket from the chassis, each lifting arm including a first arm member pivotally connected at one end to a central region of the chassis spaced from the front and rear ends of the chassis, and a second arm member pivotally connected to the other end of the first arm member;

primary drive means for pivoting the first arm members relative to the chassis; and

secondary drive means for pivoting the second arm members relative to the first arm members.

2. A refuse-handling vehicle according to claim 1, wherein the chassis is designed to carry two buckets one in front of the other, and the lifting arms are sized to load or offload each of the buckets independently of one another.
3. A refuse-handling vehicle according to either claim 1 or claim 2, wherein the first arm members are pivotable between a lowered

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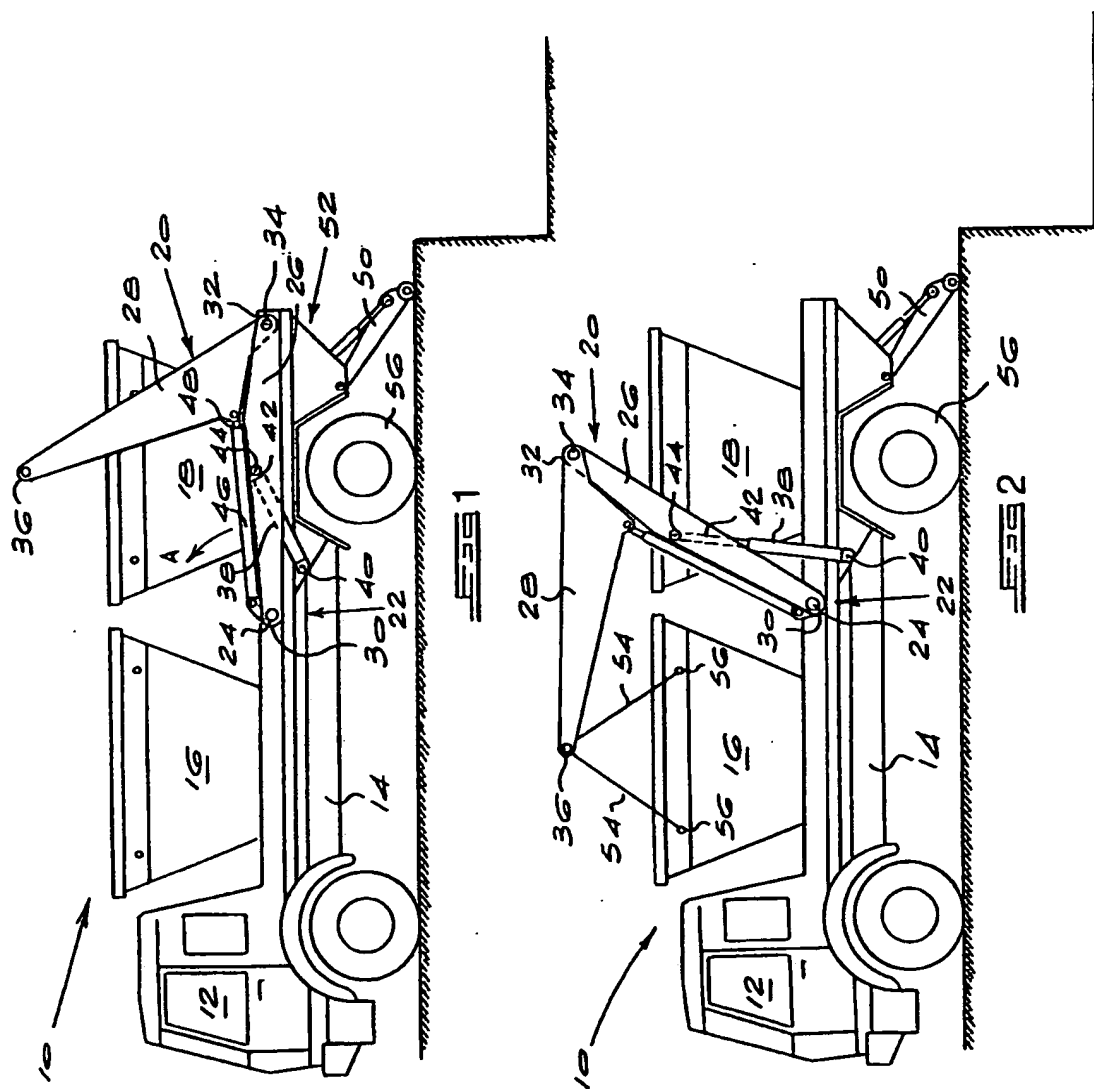
position in which they extend backwards from the central region of the chassis towards the rear end thereof and are substantially parallel with the chassis, and a raised position in which the first arm members extend upwardly from the central region of the chassis transversely to the chassis.

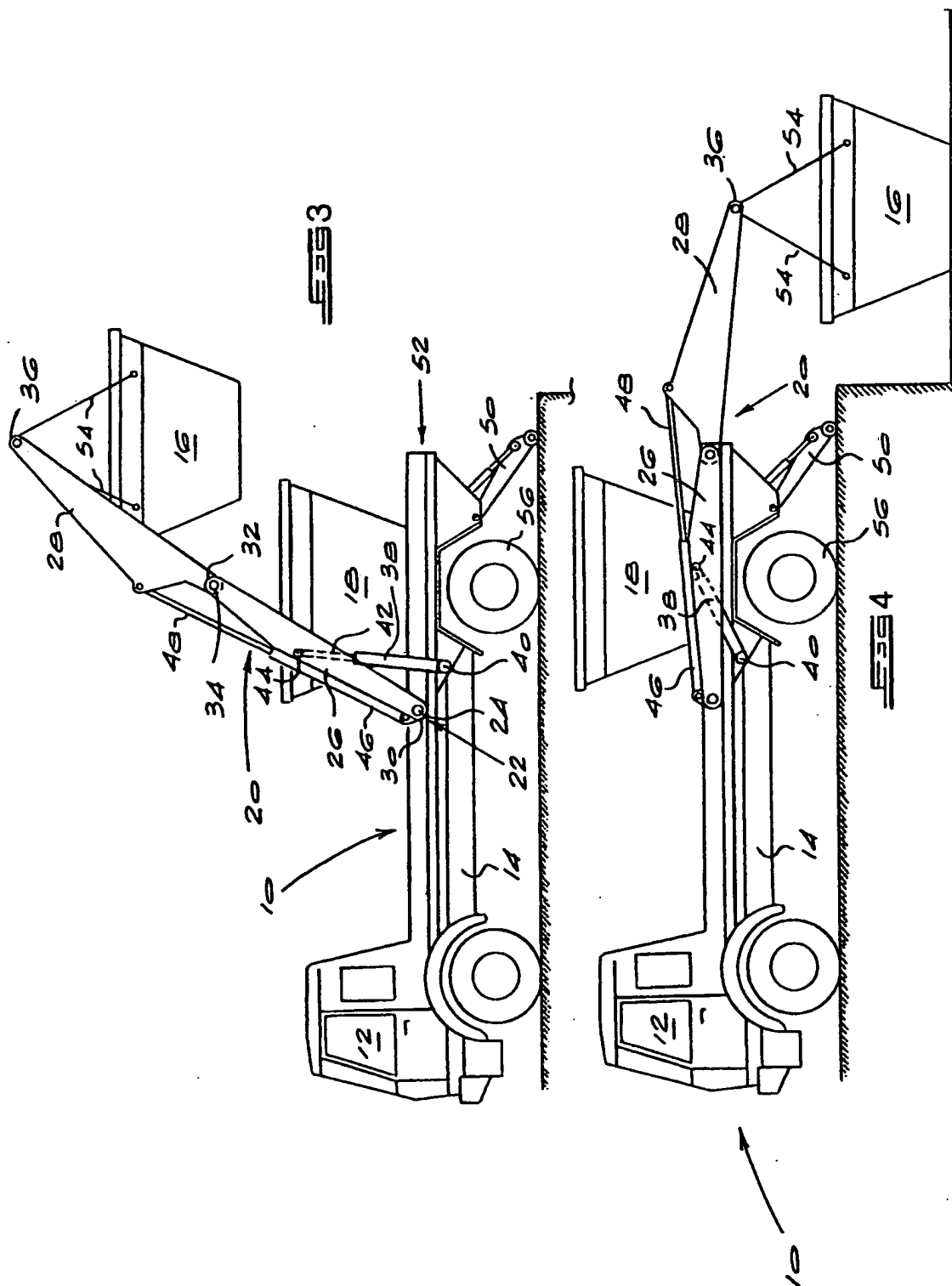
4. A refuse-handling vehicle according to any one of the preceding claims, wherein the primary and secondary drive means comprise double-acting hydraulic cylinders and rams.
5. A refuse-handling vehicle according to claim 4, wherein the hydraulic cylinders of the primary drive means are connected to the wheeled chassis and the corresponding rams of the primary drive means are connected to the first arm members so that extension of the rams from the cylinders causes the first arm members to move from the lowered position to the raised position, and retraction of the rams into the cylinders causes the first arm members to move from the raised position to the lowered position.
6. A refuse-handling vehicle according to either claim 4 or claim 5, wherein the cylinders of the secondary drive means are connected to the first arm members and the corresponding rams of the secondary drive means are connected to the second arm members so that extension of the rams from the cylinders and retraction of the rams into the cylinders causes the second arm members to pivot relative to the first arm members.

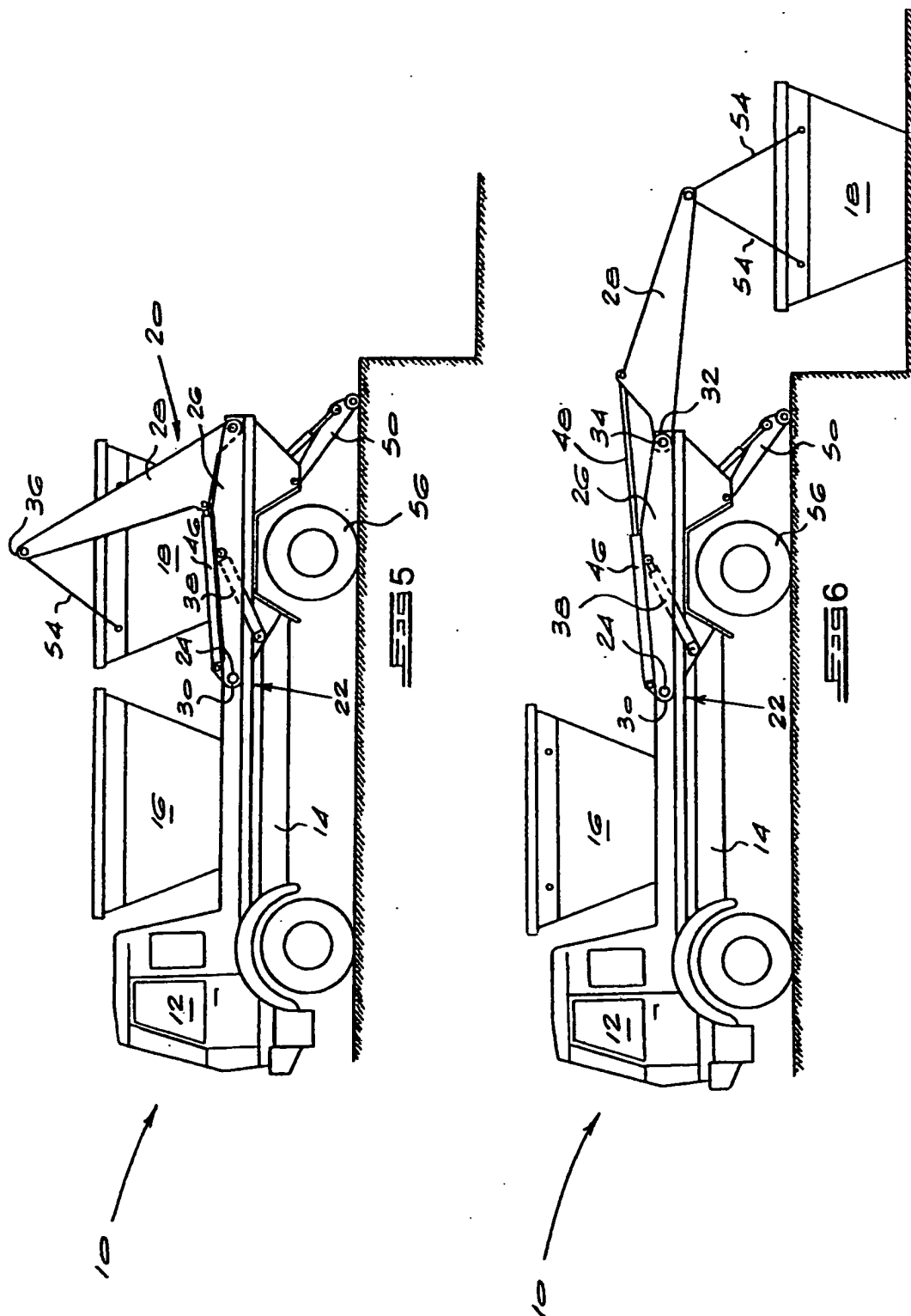
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7. A refuse-handling vehicle according to any one of the preceding claims, wherein the first arm members are connected to one another by means of a torsion bar which extends through the chassis.
8. A refuse-handling vehicle according to any one of the preceding claims, wherein the second arm members are connected to one another by means of a cross beam.
9. A refuse-handling vehicle according to any one of the preceding claims, wherein each of the second arm members carries a tipping device in the form of a cable and pulley system which is operated by a further hydraulic cylinder and ram for tipping a bucket relative to the chassis.
10. A refuse-handling vehicle substantially as herein described with reference to the accompanying drawings.









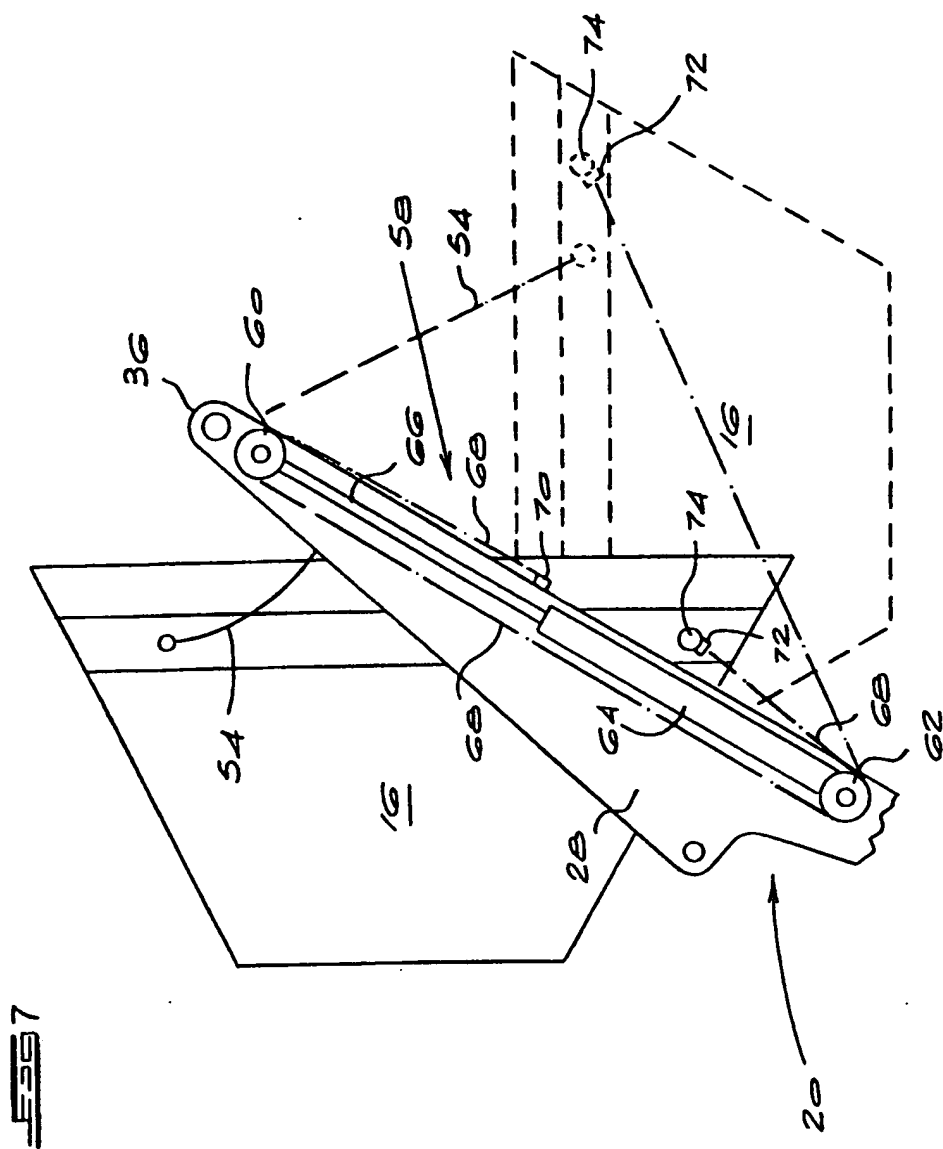


Fig. 7

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/IB 99/01665

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B60P1/48

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B60P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 295 05 271 U (GERGEN ET AL) 18 May 1995 (1995-05-18) page 5; figures	1-6,10
P,A	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 01, 29 January 1999 (1999-01-29) & JP 10 272981 A (TOYO UMPANKI CO LTD), 13 October 1998 (1998-10-13) abstract	1,2
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A	DE 92 06 282 U (ELLERMANN) 2 July 1992 (1992-07-02) page 5; claim 9; figures 1,4	1-4
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Date of the actual completion of the international search

11 January 2000

Date of mailing of the international search report

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# INTERNATIONAL SEARCH REPORT

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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